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Understanding pathways to shifting people's values over time in the context of social-ecological systems

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Abstract (250 words)

Despite rich theorisation on the structure and content of people's values and great interest in the concept of value change, there is currently little coordinated understanding of how people's values might shift over time. This paper draws upon different value traditions in a multi-level framework that articulates possible pathways of value change within individuals and groups and in a social-ecological context. Individual and group level values may change in response to events over an individual's life course or changes in social-ecological context that people are living in. Group-level values may also change as the composition of individuals within a social group change. These pathways are likely to act differently on values conceived as guiding principles (transcendental values) and values that people assign to people, places or things around them (contextual values). We present a research agenda needed to better understand these pathways: assessing the associations between value change and demographic change in a highly mobile world; developing a theoretical and empirical basis for understanding value shifts associated with social-ecological and land-use change; clearer identification of the groups of people that are subject to proposed mechanisms explaining value shifts; and bridging psychological framing of values to other more embodied

28 understandings that may be better placed to explain value shift in the context of social-
29 ecological change.

Introduction

Shifting people's values has been identified as a critical step on the road to sustainability and halting biodiversity loss (Ives and Fischer 2017a). Calls are being made for a new research agenda to better understand the dynamics of people's values in response to social-ecological change (Manfredo et al. 2017). However, the social psychology tradition suggests that people's values are difficult to shift; values are seen as fairly stable within individuals, or adapting slowly to changing circumstances over time (Gouveia et al. 2015; Milfont et al. 2016; Vecchione et al. 2016). While it has been proposed that changes in values may occur slowly in response to large changes in social-ecological context (Manfredo et al. 2017a), the mechanisms that underpin this remain unclear. Societies around the world are facing unprecedented rapid social-ecological change, and better understanding of how different kinds of values may be shifting in light of this could provide important insights for sustainability globally.

A small but growing body of empirical evidence supports thinking about the dynamics of values over time. Research in social psychology has demonstrated that an individual's value priorities can change over the life-course in response to individual and societal changes (Bardi et al. 2009). Some evidence suggests that there are both automatic (involuntary responses to external events) and effortful (intentionally selected) routes to value shift (Bardi and Goodwin 2011). Manfredo and others have argued that values at the group level are in part the outcome of people's adaptation to the social-ecological system they are living in, and thus as people's needs in relation to the environment change so can their values (Manfredo et al. 2017). Deliberation and social learning have been shown to lead to short-term shifts in people's values (Kenter et al. 2015; Raymond and Kenter 2016). At a societal/cultural level, 'economic development' (as measured by per capita GDP) has led to observable shifts

54 towards rational and self-expression values (Inglehart and Baker 2000) and autonomy and
55 egalitarianism (Schwartz 2006). At generational time scales, shifts in society's values for
56 forests have been observed away from utilitarian towards multifunctional values (Bengston et
57 al. 2004) demanding engagement with more complex understandings of sense of place and
58 place meaning by forest managers (Williams and Stewart 1998). Cross-sectional studies have
59 also highlighted that demographic factors can shape group-level values (Manfredo et al.
60 2009, 2016). Collectively, these studies suggest that values can change individually and at the
61 group level through a variety of mechanisms, but that this change is likely to be slow and
62 over long periods of time.

63 Human-engineered shifts in values can be seen as untenable (Manfredo et al., 2016) and
64 invite ethical questions about the normative positions driving this intention. However, driving
65 value change remains an important consideration for many advocates and practitioners in
66 sustainability science (Ives and Fischer 2017b). A better understanding of the relative
67 importance of mechanisms that underpin changes in people's values may unlock the
68 possibility of managing this process. To achieve this, greater theoretical and conceptual
69 clarity is required to better understand how different factors could influence shifts in values
70 within a sustainability context.

71 In this paper, we bring together literature from psychology, human geography and cultural
72 studies to develop a conceptual framework for understanding possible pathways by which
73 people's values could shift over time. We then identify avenues for future research needed to
74 develop a more holistic understanding of how these shifts in people's may occur, and to
75 understand the relative importance of these different pathways in the context of changing
76 social-ecological systems.

77 ***Conceptual background***

We conceptualise values broadly, drawing on a variety of disciplinary perspectives. In social psychology, transcendental values (also known as held or core values) are seen as abstract ideals or beliefs about desirable end states or behaviours that transcend specific situations (Schwartz and Bilsky 1987). Schwartz (1992, 1994) identified a universal and relatively stable set of values grouped into two bipolar dimensions of conflicting values: self-transcendence values (universalism and benevolence) versus self-enhancement values (power and achievement), and conservation values (security, conformity and tradition) versus openness to change values (self-direction, stimulation and hedonism). These are considered bipolar as only one dimension is active in any particular context e.g. self-transcendence or self-enhancement, but not both.

A simplified subset of Schwartz's (1992, 1994) values is often used in studies related to the environment, applied in a three-dimensional structure of biospheric, altruistic (drawn from the self-transcendent group) and egoistic values (drawn from the self-enhancement group). Each dimension represents a predisposition to evaluate the world the world for impacts on the environment and the biosphere (biospheric: e.g., protecting the environment, preventing pollution), the welfare of others (altruistic: e.g., equality, being helpful), and benefits for the self and immediate others (egoistic e.g., social status, wealth) (Stern et al. 1995; de Groot and Steg 2007). These abstract, transcendental values have some capacity to predict pro-environmental behaviours (Stern 2000) and environmentally relevant attitudes such as the acceptability of forestry management alternatives (Ford et al. 2009a). Recent work has explored the role of hedonic (pleasurable wellbeing) and eudaimonic (virtuous wellbeing) values in the accrual of benefits of connection to and contact with nature, and as drivers of pro-environmental behaviours (Winkler-Schor et al. in press; Steg et al. 2014)

These abstract, universal values are contrasted with contextual values (also known as assigned values), where people's values (and other considerations) are applied to a particular context, through a valuation process, to determine the value (or values) of contextual entities to an individual. Contextual values are influenced to some extent by transcendental values (Kenter et al. 2015; Kendal et al. 2015). For example, the Valued Attributes of Landscape Scale (VALS) asks participants to value different attributes of valued landscape context, and then determines the underlying structure of these attribute values to determine plural values for landscape (Kendal et al. 2015).

Transcendental and contextual values can also be described at the group level. This can be achieved by aggregating the response of individuals to generate group-level values e.g.

(Schwartz 2006; Raymond et al. 2014). This approach is commonly used in cross-sectional studies to explore how values vary across cultural groups (Inglehart and Baker 2000; Schwartz 2006), or across political boundaries (Manfredo et al. 2009). Group level values may also be measured by specifically eliciting values that may be shared at a group level e.g. societal, institutional and cultural values (Kenter et al. 2015).

A distinct tradition of social values draws on philosophy to distinguish between intrinsic values (things that are important of themselves) and instrumental values (things that are important to achieve some other end). Economic approaches to values have tended to focus on instrumental values (things that are important to achieve human wellbeing) and distinguish between use (the importance of the use of something) and non-use value (importance of something without reference to use, such as importance to preserve for future generations) (Turner et al. 2003). Recent approaches further distinguish relational values from instrumental and intrinsic values, where the value of contextual entities to the group or to other individuals are considered in the valuation process (Chan et al. 2016).

A framework for understanding change in people's values

A number of possible pathways exist through which people's values may change, for different kinds of values at both individual and group levels (Fig 1). First, while an individual's transcendental values may be relatively stable over time, immigration and emigration from the group over time may result in changes in the composition of transcendental values of individuals in the group (path A). Second, individuals change over time in ways that can result in shifts in their transcendental values (path B). Both changes in group composition dynamics and individual change over the life course could in turn influence aggregated transcendental values, and influence of other kinds of values related to the expression of individual transcendental values (e.g. contextual values) or related to the values of other people in the group (e.g. relational values, shared group values). Third, the social-ecological system that individuals and groups are living in may change through environmental shocks (e.g. natural disasters) and stresses (e.g. increased temperatures caused by global climate change), and social-cultural changes as a result of economic development, migration and urbanisation (path C). This most obviously and directly could result in shifts in contextual values, as the entities in the world being valued change, although it has been argued that both environmental conditions (Fischer and Boer 2016; Manfredo et al. 2016) and economic development (Inglehart and Baker 2000) are important factors shaping transcendental values.

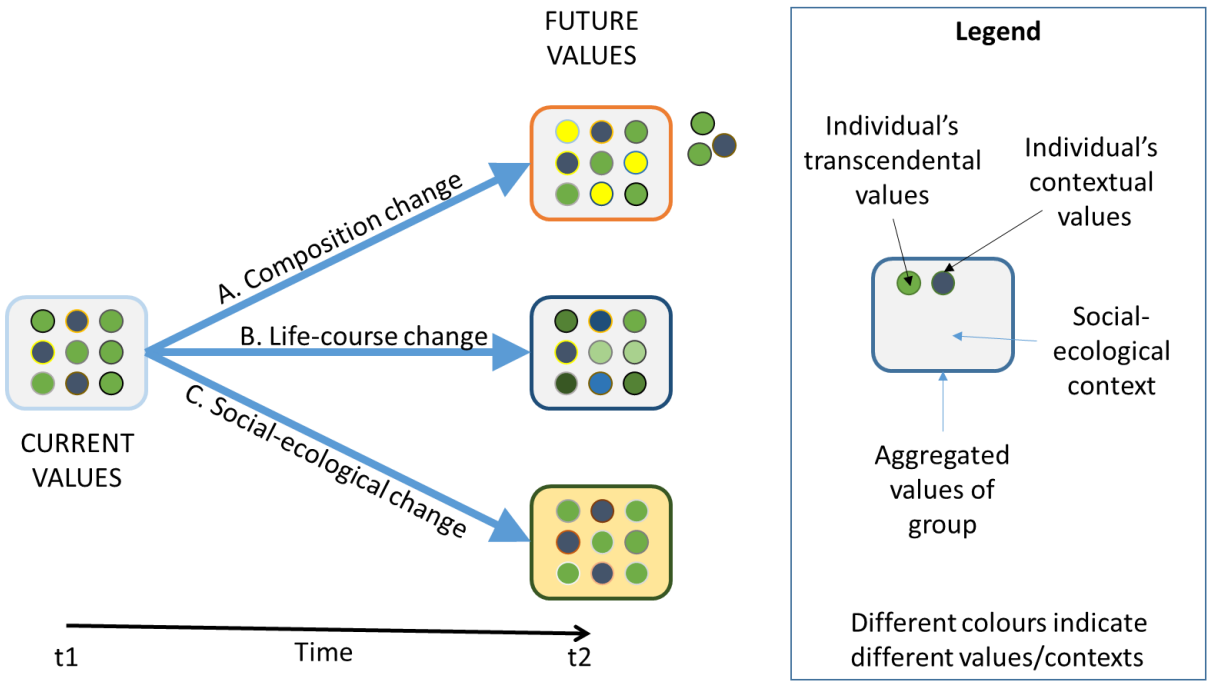

Fig.1 – A framework for conceptualising how people's values might change in time (t1 -> t2). This shows how transcendental and contextual values may change over time at both the individual and group levels through a) immigration and emigration of individuals from the group; b) change in individual's values over the life course; and c) social-ecological change.

A. Changes in composition of individuals within a group

Changes to the composition of individuals within a group can lead to shifts in people's values in several ways. First, the values of individuals are often aggregated to represent the values of a social group; as individuals change, the aggregated transcendental and contextual values of the group can change too (Schwartz 2006; Raymond et al. 2014). Second, the values of people within a group can be determined in part by other members of the group, such as in shared group values (Kenter et al. 2015), contextual values expressed on behalf of a group e.g. "maintaining an area as wilderness is of unmeasurable value to society" (Brown, 1984, p235) and relational framings of value (Chan et al. 2016).

Aggregating individual values to the group level

Individual values can be aggregated in different ways across social groups and communities. In the sustainability sciences, individual values are often aggregated to represent a broader 'community' through the mapping of landscape values (Brown and Fagerholm 2014; Garcia-Martin et al. 2017) or calculating the mean of individual responses to questions about transcendental values to inform ecosystem management (Wallace et al. 2016). Processes such as auctions and elections can be used to determine group-level contextual values (Brown, 1984).

Across time, a number of processes can lead to changes in the composition of individuals within the group of interest. Immigration to and emigration from the group can lead to differences in aggregated values where the values of immigrants differ from the values of emigrants (Manfredo et al. 2009), particularly where the values of people leaving and entering the group are consistently different. Similarly, births (and subsequent value formation through childhood and early adulthood) and deaths can similarly lead to change in aggregated values when the new members of the group have values that are different from those leaving the group. These processes could lead to pronounced changes in people's values when a high proportion of individuals within the group change. This has been demonstrated for 'tree changers' where lifestyle landholders with stronger conservation values are replacing traditional agricultural farmers in rural Australia (Mendham et al. 2012) , and in urban areas where residents become displaced or excluded in areas of re-greening due to rising property values (Quastel 2009).

How individuals within a group may influence each other's values

Changes in group composition may also directly influence the values of other members of the group. People influence each others values through processes of value socialisation and internalisation (van Riper et al, 2018). Studies on the parent-child relationship suggest that

185 socialization is an ongoing process of parents attempting to pass on their values to children.
186 Greater parent monitoring and strictness have been associated with more parent-adolescent
187 agreement (Pratt et al. 2003), although variations in these relationships have been identified
188 within sub-groups (Knafo and Schwartz 2001) and across cultures (Tulviste et al. 2012).
189 Value socialization not only involves relationships between parents and children, but also
190 transactions with the surrounding culture and with the parents' own changing ideas about
191 what to pass on to their children (see e.g. Kuczynski et al. 1997). Children and adolescents
192 can challenge and sometimes resist the values of adults that they consider to be inappropriate,
193 immoral, or illegitimate, or otherwise not in line with the group (Smetana et al. 2014). Values
194 can also change in response to signals about socially prescribed roles in adulthood, as
195 evidenced by increases in security, conformity, and tradition values into adulthood
196 (Vecchione et al. 2016).

197 At a cultural level, values are ingrained in norms, attitudes and behaviours that exist within
198 and between collectives (van Riper et al., in press). In the environmental values literature,
199 recent research points to bi-directional relationships between both individual and cultural
200 values on the one hand and collective action on the other hand (van Riper et al, in review).
201 Cultural values influence an individual’s transcendental values through socialization,
202 internalisation or by participation in collective action. Individual values can become cultural
203 values when they are accepted as a set of norms and values by the group over a long period of
204 time (van Riper et al, this feature).

205 Deliberation and engagement in social learning processes are two key mechanisms that can
206 catalyse otherwise transitory changes to people’s values (Kenter et al. 2016). A typology of
207 transformative learning distinguishes learning about the consequences of actions, from
208 reflecting on the assumptions which underpin actions, and from learning that challenges these

assumptions (Reed et al. 2010). Changing group composition is likely to influence how cultural, socialisation and bi-directional processes shape group values and shared values in different collective decision-making contexts. Group composition influences how values converge during deliberative processes (Newig and Fritsch 2009), and group diversity influences the rate of social learning that occurs (Wright and Rowe 2011; Cuppen 2012). However, it is less clear how cultural, socialisation and bi-directional processes affect value formation and change within the individual or group within such contexts.

B. Socio-psychological processes within the individual

Social and environmental psychologists have studied the factors driving shifts in transcendental values within *individuals* across time. Value change theory suggests that there are two systematic, internal, sources of change in values within the individual: physical aging and major life events during the life course (Bardi and Goodwin 2011; Fischer et al. 2011; Gouveia et al. 2015; Milfont et al. 2016; Vecchione et al. 2016). Across all domains, most studies show that observed changes in values are not random but rather follow predicted patterns according to people's value systems (Lehmann and Payne 1963; Milfont et al. 2016).

Shifts in transcendental values in response to age

Individuals' value priorities vary with age (see Milfont et al. 2016 for an overview). In cross-sectional studies, age has been correlated positively with conservation and self-transcendence values and negatively with openness to change and self-enhancement values (Schwartz 2005; Robinson 2013). Longitudinal studies have demonstrated that values change slowly throughout life as a reflection of biological and psychological maturation. Milfont et al. (2016) found that older adults and women placed greater emphasis on values relating to the welfare of others and preservation of traditional practices and stability (Self-Transcendence and Conservation values). Younger individuals and men tended to more highly value the

pursuit of status and power, and independent thought and behaviour (Self-Enhancement and Openness to Change). Value change can also exhibit non-linear patterns, suggesting that values can have different functions for different development stages. Conservation-related values have been shown to follow a U-shape pattern of change with across ages, with an initial decline during adolescence followed by a steady increase into adulthood (Gouveia et al. 2015).

Age differences in values can be explained by multiple factors. These include loss of strength and cognitive speed over the life; for example, promoting a shift from stimulation values earlier in life to conformity and tradition values later in life (Milfont et al. 2016). It also can relate to changing opportunity and demands across life stages. Milfont et al. point out that stimulation values should be less important in middle adulthood than security and conformity as a result of work and family responsibilities.

Shifts in transcendental values response to major life events during the life course

Research suggests that major life events might affect intra-individual value change more so than age (Bardi et al. 2009; Milfont et al. 2016). Values can be challenged by major life transition such as unemployment (Bardi and Goodwin 2011), migration (Lönnqvist et al. 2011; Goodwin et al. 2012; Bardi et al. 2014), vocational training and education (Bardi et al. 2014) and transitions to adulthood (Vecchione et al. 2016). Values can also change in response to changing roles associated with life stages, such as marriage, widowhood, and child rearing (Kuczynski et al. 1997; Bardi and Goodwin 2011). The reasons for such value changes are mixed; for example, they can relate to the fulfilment of different hierarchies of needs, as in the case of new migrants where heightened levels of security values have been

identified post-migration (Lönnqvist et al., 2011), or increased value socialization, resulting from involvement in various training and education programs (Bardi et al. 2014).

Across time these changes are likely to affect aggregated transcendental values, particularly where there are consistent changes within a group, such as rising education levels. These changes are also likely to change other kinds of values such as contextual and relational values where they are influenced by transcendental values.

C. Social-ecological context

Shifts in transcendental values in response to societal development

Values can shift in response to broader societal changes (Bardi and Goodwin 2011; Fischer et al. 2011; Gouveia et al. 2015; Milfont et al. 2016; Vecchione et al. 2016). Longitudinal studies have shown how processes of modernization (e.g., industrialization, occupational specialization, and centralization) have resulted in a shift toward materialistic values Inglehart (1997). The widely used New Environmental Paradigm scale (Dunlap & van Liere, 1978) that measures environmental worldviews is premised on the idea that idea that the dominant social paradigm had become outmoded by increasing awareness of the ecological degradation caused by traditional approaches to progress and growth. Post-industrialisation has since fostered a shift to humanitarian values, such as belongingness, and aesthetic or quality of- life concerns (Abramson and Inglehart 1995), and more mutualistic wildlife values (Manfredo et al. 2009). Consistent with this theory, values have been demonstrated to shift with socioeconomic development, toward values emphasizing empowerment, intellectual autonomy, egalitarianism, and greater appreciation of natural and social environments (Welzel et al. 2003; Schwartz 2006; Welzel 2014).

It has been theorised that social values can change slowly in response to changing historical, ecological, economic, institutional, and cultural events and circumstances (Inglehart and Baker 2000; Schwartz et al. 2000). Unfavourable life events lead individuals to become more materialistic and to emphasise security, whereas increasing prosperity and favourable life conditions promote self-expression (e.g., Maslow 1943; Inglehart and Baker 2000). For example, the importance of security, tradition, benevolence, and, to a lesser extent, conformity values increased after the Global Financial Crisis (Sortheix et al. 2017).

Shifts in contextual values relation to ecological change

In the traditional understanding of transcendental and contextual values, the role of social-ecological context is clear – relatively stable transcendental values are applied differently in different contexts. Thus, as the environment changes, environmentally relevant contextual values are also likely to change. Relatively small scale, longitudinal studies of landscape values (contextual values that are spatially distributed across a landscape) have shown relatively little change in the composition and distribution of these contextual values over time in both Kangaroo Island, Australia (2004-2010) and Alaska, USA (1998-2012) (Brown and Weber 2012; Brown and Donovan 2014). However, the same studies demonstrate large differences in the distribution of landscape values across land-uses, and suggested that "land-use changes such as those resulting from human development will significantly influence the distribution of landscape values" (Brown and Weber 2012, p316). The idea that ecological variation in space and time is directly related to value is often built into ecosystem service valuations, where ecological properties are used to predict the value of ecological systems. River hydro-geomorphological characteristics have been linked to differing values of rehabilitation projects (Thorp et al. 2010). At a larger scale, land-use change has resulted in a

loss of global ecosystem services estimated to be worth US$4.3-20.2 trillion/year between 1997 and 2011 (Costanza et al. 2014).

Shifts in transcendental values relation to ecological change

Transcendental values are generally thought to be fairly stable in response to environmental change. Cross-sectional studies have largely focussed on cultural determinants of differences in values (e.g. Schwartz 2006) rather than environmental determinants (not unsurprisingly given hostility towards environmental determinism). However, recent work suggests that ecological context can structure value expression; in places where ecological stress or threats are low, there tends to be less alignment between values and both attitudes and behaviours (Fischer and Boer 2016).

Perhaps surprisingly, transcendental values have not been a fundamental component of most social ecological systems frameworks, although contextual values such as the economic value of resources are a feature of many of these frameworks (Ostrom 2009; Binder et al. 2013). Incorporating transcendental values could benefits these frameworks by better understanding the plural motivations of actors within the system. A social-ecological systems approach has been used to explore how transcendental values may shift in response to environmental change (Manfredo et al. 2017). In this framing, humans are seen as part of the system and their transcendental values are formed in response to both social and environmental surroundings. For example, it has been argued that the American frontier environment led to cultural values of independence, that in turn were transmitted to the rest of the country (Kitayama et al. 2010). Manfredo et al. (2017) argue that value shift in response to social-ecological change is likely to be slow, and continues to reflect pre-existing differences in values between social-ecological systems. While value shift in response to societal change has been demonstrated in longitudinal and cross-sectional studies, the same level of evidence

is not yet available to demonstrate shifts in environmentally relevant transcendental values in response to ecological change.

A research agenda for understanding and assessing shifts in people's values

Perhaps surprisingly, there has been limited comparative exploration of the importance of different drivers in shifting different kinds of values. In the framework presented here, the psycho-social processes that underpin shifts in individual transcendental values over the life course are most well understood. Great research challenges and opportunities remain to better understand the role of drivers such as demographic and social-ecological change on individual, cultural and institutional values. A better understanding of these drivers is particularly important in a sustainability context, where some practitioners (e.g. Common Cause) have a mission to change people's values (Manfredo et al. 2017; Ives and Fischer 2017a), and there is growing recognition that we have entered an age of global rapid social-ecological change that is likely to have some effect on people's values. We identify four key research opportunities to develop this understanding.

Assessing the associations between changes in people's values and demographic change in a highly mobile world

People are more mobile than they have ever been. Globally, there have been dramatic shifts e.g. away from rural areas to cities (UN Habitat 2013). The dismantling of racist immigration programs e.g. the White Australia Policy and civil rights movements have led to desegregation and the rapid rise of increasingly multicultural cities and regions in many places around the world (Mann 2012). Rising numbers of refugees have led to even more dramatic cultural mixing, as people are displaced and seeking refuge wherever it can be

found. Such trends result in new intercultural dynamics based on everyday negotiations of space and place between cultures (Radford 2016). Within countries, phenomena such as tree-change, gentrification and fly-in, fly-out work are dramatically changing the cultural and demographic composition of particular places (Mendham et al. 2012; Carson and Carson 2014; Halasz 2018).

It is likely that this unprecedented mobility is leading to shifts in transcendental and contextual values in individuals and at the group level. Yet there is an absence of theory and empirical evidence to support policy and planning in this space. While transcendental value shift may be slow, the rapid rise in mobility may be leading to observable shifts in transcendental values, both in individuals, in other members of social groups and in aggregated measures. This landscape of highly mobile individuals provides a rich resource for future research on the effects of mobility on the transcendental values of people who are moving, on the communities they are moving into, and the communities they are leaving behind.

Examining shifts in people's values associated with social-ecological and land use change

In addition to increasing mobility, the world is undergoing rapid changes in intertwined social-ecological systems (McPhearson et al. 2016). Global environmental change is leading to regime shift in ecological systems (Hughes et al. 2013). Climate change and urban heat are changing the composition and distribution of everyday nature such as urban trees (Kendal et al. 2018). New patterns of agricultural production and urban expansion are leading to dramatic land use change in many places (Hegazy and Kaloop 2015; Bryan et al. 2016). The rapid rise of digital technologies and virtual ecologies (how the natural, built, sociocultural and virtual features of environments are interconnected and influence each other as part of a multi-faceted system) are leading to rapid changes to physical environments (Stokols 2018).

Theory predicts slow (multi-generational) shifts in transcendental values based on social-ecological change (Manfredo et al. 2017), yet increasingly rapid change affecting environmental risk and security thought to be important in shaping people's values (Fischer and Boer 2016) could potentially lead to rapid shifts in these values. While cross-sectional studies demonstrate significant differences in contextual values across land-uses, the dynamics of value change in response to ecological change (and associated changes to virtual ecologies) is poorly understood. Future research could assess the relationships and pathways linking environmental and value change using longitudinal methods. A fertile area of enquiry is to examine how transcendental values may change in response to different forms of ecological change.

It is also likely that changes in peoples' values are mediated by their beliefs about the consequences of social-ecological change (*sensu* Stern et al. 1999). If people believe that there will be adverse consequences on things that are important to them, it is more likely that they will undertake behaviours that address these consequences. These adverse consequences are more likely to be believed where they are consistent with people's values. Conversely, people may not accept information that social-ecological change is occurring where this is inconsistent with their values (Straka et al. 2016). Similarly, beliefs about the effects of social-ecological change on others is likely to be shaped by values, and therefore beliefs are also likely to affect values shared with or influenced by others, such as relational values or values elicited through deliberative processes.

Bridging differing understandings of values

While this paper largely adopts a social psychological framing of values, alternative perspectives are acknowledged and may contribute to a better understanding of value shift, particularly in the context of changing social-ecological systems. Critics of psychological

approaches argue that psychological conceptualisation of values are disconnected from drivers of sustainability outcomes such as human behaviour – the 'value-action gap' (Shove 2010). Disciplines such as sociology, anthropology and human geography instead conceptualise values to be, at least in part, socially constituted and therefore an expression of group ideals rather than just individual guiding principles (Demski et al. 2015). Rather than dichotomous – either transcendental or contextual – values are instead both embodied within a particular context and produced through interactions in the world (Raymond et al. 2018). From this perspective, values are neither completely abstract nor contextual, rather seen as 'salient cultural resources ... ideals that require people to engage pragmatically with material and social arrangements that are not consistent with them' (Demski et al. 2015, p60). These more embodied framings of values could be particularly useful in better understanding value shift in response to social-ecological change, as values are necessarily constructed through practices performed within the system i.e. values do not only influence behaviours, but behaviours can also influence values. They would also seem to be particularly useful in a sustainability context that is interested both in what is important to people, and the way they live in the world.

Pursuing more meaningful understandings of 'community'

Of course, the careful definition and sampling of the population of interest is critical to determining aggregated group-level values. Too often in values research, the population of interest is defined by convenience rather than in a manner that is closely connected to the values we are trying to measure: the general public, visitors, stakeholders or local people. A useful approach to identifying a meaningful sample frame distinguishes between *communities of place, interest, practice, and identity* (Harrington et al. 2008; Seymour et al. 2011).

Communities of place group people by geographic location, defined by a set of social, political and/or natural boundaries (Cheng et al. 2003; Harrington et al. 2008) (e.g. rural and urban landholders (Ives and Kendal 2013)). However, geography can be a poor predictor of values. *Communities of interest,* include people with shared interests or concerns that may not be spatially defined, and *communities of practice* share an activity such as conservation management, or farming (Seymour et al. 2011), may be more useful frames for understanding variation in values (Ford et al. 2009b). *Communities of identity* include people who share a common identity such as cultural background, class, age, gender, social networks, politics or practices that are spatially diffuse. This may be even more important with the rise of largely aspatial social media networks. Particular communities of identity such as the socioeconomically disadvantaged and youth are often underrepresented in studies of values and better representation of these communities could have important sustainability outcomes (Haase et al. 2017).

Conclusion

Here we have presented a conceptual framework that identifies three pathways that can lead to value shift in both transcendental and contextual values related to the environment. First, changes in the composition of individuals within groups can lead to changes in aggregated values of the group, and may influence the values of other members of the group such as shared social values, cultural values and relational values. Second, changes in individuals over the life course such as parenthood and maturation are known to change those individual's transcendental values. This in turn is likely to change people's contextual values in response to the world around them and the values of others. Third, changes in the social-ecological context are also known to influence transcendental values over time, demonstrated by post-industrial economic development leading to observed shifts in humanitarian and mutualistic values; yet the relationship between environmental change and both

transcendental and contextual value shift is poorly defined, and demands further empirical exploration.

This is fertile terrain for future theoretical and empirical study. Increasing mobility, rapid social-ecological change and the rise of virtual ecologies provides opportunities to study and test proposed mechanisms to explain value shift. However, group definition is critical to the accurate and meaningful representation of group values; future studies could more carefully define sampling frames, such as focus on communities of practice and identity that are more closely related to proposed mechanisms explaining value shift. Lastly, bridging psychological understandings of values with different framing of values that are better linked to the social-ecological context they are produced in, such as the more embodied understanding of values in human geography and sociology, could help to develop testable theory for changing social-ecological systems (acknowledging that some disciplinary divides will not be amenable to bridges).

Understanding pathways leading to shifts in values is needed to help policy makers meaningfully incorporate values into public policy (sensu Denhardt and Denhardt 2000) in a changing social-ecological system. And perhaps, understanding the mechanisms underpinning value shift can help those who believe that shifting people's values is a necessary step to creating a more sustainable future (Ives and Fischer 2017a).

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